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1. Document ID: US 20040185114 A1

L3: Entry 1 of 8 File: PGPB Sep 23, 2004

DOCUMENT-IDENTIFIER: US 20040185114 A1
TITLE: Starch encapsulation

Summary of Invention Paragraph:
[0022] This invention provides a hybrid polypeptide comprising a starch-encapsulating region (SER) from a starch-binding enzyme fused to a payload polypeptide which is not endogenous to said starch-encapsulating region, i.e. does not naturally occur linked to the starch-encapsulating region. The hybrid polypeptide is useful to make modified starches comprising the payload polypeptide. Such modified starches may be used to provide grain feeds enriched in certain amino acids. Such modified starches are also useful for providing polypeptides such as hormones and other medicaments, e.g. insulin, in a starch-encapsulated form to resist degradation bv stomach acids. The hybrid polypeptides are also useful for producing the payload polypeptides in easily-purified form. For example, such hybrid polypeptides produced by bacterial fermentation, or in grains or animals, may be isolated and purified from the modified starches with which they are associated by artknown techniques.

Summary of Invention Paragraph:
[0024] The term "hybrid polypeptide" means a polypeptide composed of peptides or polypeptides from at least two different sources, e.g. a starch-encapsulating region of a starch-binding enzyme, fused to another polypeptide such as a hormone, wherein at least two component parts of the hybrid polypeptide do not occur fused together in nature.

Summary of Invention Paragraph:
[0028] The starch-encapsulating region of the hybrid polypeptide may be a starch-encapsulating region of any starch-binding enzyme known to the art, e.g. an enzyme selected from the group consisting of soluble starch synthase I, soluble starch synthase II, soluble starch synthase III, granule-bound starch synthase, branching enzyme I, branching enzyme IIa, branching enzyme IIBb and glucoamylase polypeptides.

Summary of Invention Paragraph:
[0029] When the hybrid polypeptide is to be used to produce payload polypeptide in pure or partially purified form, the hybrid polypeptide preferably comprises a cleavage site between the starch-encapsulating region and the payload polypeptide. The method of isolating the purified payload polypeptide then includes the step of contacting the hybrid polypeptide with a cleaving agent specific for that cleavage site.

CLAIMS:

1. A hybrid polypeptide comprising: (a) a starch-encapsulating region; (b) a payload polypeptide fused to said starch-encapsulating region.

5. The hybrid polypeptide of claim 1 wherein said starch-encapsulating region is the starch-encapsulating region of an enzyme selected from the group consisting of soluble starch synthase I, soluble starch synthase II, soluble starch synthase III, granule-bound starch synthase, branching enzyme I, branching enzyme Ia, branching enzyme IIBb and glucoamylase polypeptides.

6. The hybrid potypeptide of claim 1 comprising a-cleavage site between said starch-encapsulating region and said payload polypeptide.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

2. Document ID: US 20030170293 A1

L3: Entry 2 of 8 File: PGPB Sep 11, 2003

DOCUMENT-IDENTIFIER: US 20030170293 A1
TITLE: Thermotolerant phytase for animal feed

Summary of Invention Paragraph:
[0039] The invention also encompasses a transformed plant cell, plant part and a plant comprising a nucleic acid molecule which encodes a fusion polypeptide comprising the thermotolerant phytase of the invention. In a preferred embodiment, the plant comprises a fusion polypeptide comprises a .gamma.-zein N-terminal signal sequence operably linked to the thermotolerant phytase. In another preferred embodiment, the plant comprises a fusion polypeptide comprising SEKDEL operably linked to the C-terminus of the thermotolerant phytase. In another preferred embodiment, the plant comprises a fusion polypeptide comprising an N-terminal waxy amyloplast targeting peptide operably linked to the thermotolerant phytase. In another preferred embodiment, the plant comprises a fusion polypeptide comprising a waxy starch encapsulating domain operably linked to the C-terminus of the thermotolerant phytase.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

3. Document ID: US 20030135885 A1

L3: Entry 3 of 8 File: PGPB Jul 17, 2003

DOCUMENT-IDENTIFIER: US 20030135885 A1
TITLE: Self-processing plants and plant parts

Detail Description Paragraph:
Expression of Fusion of 797GL3 .alpha.-Amylase and Starch Encapsulating Region in E. coli

Detail Description Paragraph:
[0235] A construct encoding hyperthermophilic 797GL3 .alpha.-amylase fused to the starch encapsulating region (SER) from maize granule-bound starch synthase (waxy) was introduced and expressed in E. coli. The maize granule-bound starch synthase cDNA (SEQ ID NO:7) encoding the amino acid sequence (SEQ ID NO:8)(Klosgen RB, et al. 1986) was cloned as a source of a starch binding domain, or starch encapsulating region (SER). The full-length cDNA was amplified by RT-PCR from RNA prepared from maize seed using primers SV57 (5'AGCGAATTCATGGCGGCTCTGGCCACGT 3') (SEQ ID NO: 22) and SV58 (5'AGCTAAGCTTCAGGGCGCGGCCACGTTCT 3') (SEQ ID NO: 23) designed from GenBank Accession No. X03935. The complete cDNA was cloned into pBluescript as an EcoRI/HindIII fragment and the plasmid designated pNOV4022.

4. Document ID: US 20020081331 A1

L3: Entry 4 of 8 File: PGPB Jun 27, 2002

DOCUMENT-IDENTIFIER: US 20020081331 A1
TITLE: Film forming compositions comprising modified starches and iota-carrageenan and methods for manufacturing soft capsules using same

Summary of Invention Paragraph:
[0035] Thus, there is disclosed, a composition suitable for forming a film for encapsulating materials, the composition comprising a modified starch and iota-carrageenan in a ratio by weight of at least 1.5:1; said film capable of fusion under a pressure of at least about 207 kPa (30 psi). There is further disclosed a composition wherein the weight ratio of modified starch to iota-carrageenan ranges from 1.5:1 to 4:1, more preferably from 2:1 to 3:1. Further, the invention relates to a film forming composition that is capable of fusion, under pressure, in the range of 207 kPa to 2070 kPa (30 to 300 psi) and at temperatures in the range of from 25-80.degree. C. In a yet more preferred embodiment, the film according to the present invention has a melting temperature of from 2 to 25.degree. C., more preferably 3-15.degree. C. and most preferably 4-9.degree. C. above its fusion temperature.

5. Document ID: US 6582727 B2

L3: Entry 5 of 8 File: USPT Jun 24, 2003

DOCUMENT-IDENTIFIER: US 6582727 B2
TITLE: Film forming compositions comprising modified starches and iota-carrageenan and methods for manufacturing soft capsules using same

Brief Summary Text (34):
Thus, there is disclosed, a composition suitable for forming a film for

encapsulating materials, the composition comprising a modified starch and iota-carrageenan in a ratio by weight of at least 1.5:1; said film capable of fusion under a pressure of at least about 207 kPa (30 psi). There is further disclosed a composition wherein the weight ratio of modified starch to iota-carrageenan ranges from 1.5:1 to 4:1, more preferably from 2:1 to 3:1. Further, the invention relates to a film forming composition that is capable of fusion, under pressure, in the range of 207 kPa to 2070 kPa (30 to 300 psi) and at temperatures in the range of from 25-80.degree. C. In a yet more preferred embodiment, the film according to the present invention has a melting temperature of from 2 to 25.degree. C., more preferably 3-15.degree. C. and most preferably 4-9.degree. C. above its fusion temperature.

6. Document ID: US 6340473 B1

L3: Entry 6 of 8 File: USPT Jan 22, 2002

DOCUMENT-IDENTIFIER: US 6340473 B1
TITLE: Film forming compositions comprising modified starches and iota-carrageenan and methods for manufacturing soft capsules using same

Brief Summary Text (38):
Thus, there is disclosed, a composition suitable for forming a film for encapsulating materials, the composition comprising a modified starch and iota-carrageenan in a ratio by weight of at least 1.5:1; said film capable of fusion under a pressure of at least about 207 kPa (30 psi). There is further disclosed a composition wherein the weight ratio of modified starch to iota-carrageenan ranges from 1.5:1 to 4:1, more preferably from 2:1 to 3:1. Further, the invention relates to a film forming composition that is capable of fusion, under pressure, in the range of 207 kPa to 2070 kPa (30 to 300 psi) and at temperatures in the range of from 25-80.degree. C. In a yet more preferred embodiment, the film according to the present invention has a melting temperature of from 2 to 25.degree. C., more preferably 3-15.degree. C. and most preferably 4-9.degree. C. above its fusion temperature.

7. Document ID: US 6107060 A

L3: Entry 7 of 8 File: USPT Aug 22, 2000

DOCUMENT-IDENTIFIER: US 6107060 A
TITLE: Starch encapsulation

Brief Summary Text (23):
This invention provides a hybrid polypeptide comprising a starch-encapsulating region (SER) from a starch-binding enzyme fused to a payload polypeptide which is not endogenous to said starch-encapsulating region, i.e. does not naturally occur

linked to the starch-encapsulating region. The hybrid polypeptide is useful to make modified starches comprising the payload polypeptide. Such modified starches may be used to provide grain feeds enriched in certain amino acids. Such modified starches are also useful for providing polypeptides such as hormones and other medicaments, e.g. insulin, in a starch-encapsulated form to resist degradation by stomach acids. The hybrid polypeptides are also useful for producing the payload polypeptides in easily-purified form. For example, such hybrid polypeptides produced by bacterial fermentation, or in grains or animals, may be isolated and purified from the modified starches with which they are associated by art-known techniques.

Brief Summary Text (25):
The term "hybrid polypeptide" means a polypeptide composed of peptides or polypeptides from at least two different sources, e.g. a starch-encapsulating region of a starch-binding enzyme, fused to another polypeptide such as a hormone, wherein at least two component parts of the hybrid polypeptide do not occur fused together in nature.

Brief Summary Text (29):
The starch-encapsulating region of the hybrid polypeptide may be a starch-encapsulating region of any starch-binding enzyme known to the art, e.g. an enzyme selected from the group consisting of soluble starch synthase I, soluble starch synthase II, soluble starch synthase III, granule-bound starch synthase, branching enzyme I, branching enzyme IIa, branching enzyme IIBb and glucoamylase polypeptides.

Brief Summary Text (30):
When the hybrid polypeptide is to be used to produce payload polypeptide in pure or partially purified form, the hybrid polypeptide preferably comprises a cleavage site between the starch-encapsulating region and the payload polypeptide. The method of isolating the purified payload polypeptide then includes the step of contacting the hybrid polypeptide with a cleaving agent specific for that cleavage site.

CLAIMS:

1. A hybrid polypeptide comprising:

(a) a starch-encapsulating region;

(b) a payload polypeptide fused to said starch-encapsulating region.

4. The hybrid polypeptide of claim 1 wherein said starch-encapsulating region is the starch-encapsulating region of an enzyme selected from the group consisting of soluble starch synthase I, soluble starch synthase II, soluble starch synthase III, granule-bound starch synthase, branching enzyme I, branching enzyme IIa, branching enzyme IIBb and glucoamylase polypeptides.

5. The hybrid polypeptide of claim 1 comprising a cleavage site between said starch-encapsulating region and said payload polypeptide.

6. A hybrid polypeptide comprising a starch-encapsulating region of a starch-binding enzyme, wherein said starch-encapsulating region is fused to a polypeptide and said polypeptide is not endogenous to starch granules.

8. The hybrid polypeptide of claim 6 wherein said starch-encapsulating region is said starch-binding enzyme.

18. The hybrid polypeptide of claim 1 wherein said starch-encapsulating regions is said starch-binding enzyme.

8. Document ID: US 4232047 A

L3: Entry 8 of 8 File: USPT Nov 4, 1980

DOCUMENT-IDENTIFIER: US 4232047 A
TITLE: Food supplement concentrate in a dense glasseous extrudate

CLAIMS:

1. An encapuslated product in the form of spice concentrates and simulated spices,

comprising from about one-half to about forty percent by weight of an agent selected from the group consisting of essential oils, oleoresins, and mixtures thereof,

said agent being dispersed throughout and encased within but recoverable from an enveloping matrix comprising a fused encapsulating material selected from the group consisting of starches, cereal flour, modified starches, gums, proteins, and mixtures thereof,

said agent being distributed throughout said encapsulating material as a micro dispersion of from about five microns to submicron in size, and

said encapsulated product having a density in the range of from about fifty-five to about ninety pounds per cubic foot;

said encapsulated product containing said micro dispersion being the product obtained by blending said encapsulating material, said agent, and from about ten to about forty percent by weight of water based on the total weight of encapsulating material and water to provide a friable blend, subjecting said blend through extrusion to pressure and to heat to form a glasseous melt, and extruding said melt under non-puffing conditions,

the resulting said product constituting a substantially homogeneous, dense, essentially unexpanded, translucent-to-glassy extrudate,

each said encapsulated product exhibiting excellent stability on long-term storage, and being suitable for adding to foods as a flavoring therefor.

5. The method of flavoring a food product, said method comprising the steps of

preparing a storage-stable, dense, glassy concentrate of an agent selected from the group consisting of essential oils, oleoresins, and mixtures thereof,

said agent being dispersed throughout and encased within but recoverable from an enveloping matrix comprising a fused encapsulating material selected from the group consisting of starches, cereal flour, modified starches, gums, proteins, and mixtures thereof,

said concentrate comprising from about 1/2 to about 20% by weight of said agent distributed as a micro-dispersion throughout said encapsulating material,

said concentrate containing said micro-dispersion being prepared by blending said encapsulating material, said agent and from about 10 to about 40% by weight of water based on the total weight of encapsulating material and water, to provide a friable blend, subjecting said blend through extrusion to pressure and to heat to form a glasseous melt, and extruding said melt under non-puffing conditions,

thereby to yield a substantially homogeneous, dense, essentially unexpanded, translucent-to-glassy extrudate having a density in the range of from about 55 to about 90 pounds per cubic foot,

said agent being distributed substantially uniformly throughout said extrudate as a dispersed phase of micro particles of from about 5 microns to sub-micron in size in an enveloping matrix of said encapsulating material to provide a concentrate of said agent in which said agent is stable against loss and deterioration, and

incorporating said concentrate in a food product to impart flavor thereto.

Term	Documents
STARCH	188249
STARCHES	42438
FUSION	152828
FUSIONS	20497
FUSED	218941
FUSEDS	2
HYBRID	145761
HYBRIDS	32867
ENCAPSULAT$3	0
ENCAPSULAT	247
ENCAPSULATAED	1
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L29 0 FILE DRUGU
L30 0 FILE EMBAL
L31 0 FILE EMBASE

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L63           0 FILE SCISEARCH
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L67           0 FILE USPAT2
L68           0 FILE VETB
L69           0 FILE VETU
L70           0 FILE WATER
L71           0 FILE WPIDS
L72           0 FILE WPIFV

TOTAL FOR ALL FILES
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                (FUSION OR FUSED OR HYBRID)

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UNMATCHED RIGHT PARENTHESIS 'HYBRID))'
The number of right parentheses in a query must be equal to the
number of left parentheses.

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L105          0 FILE ESBIOBASE
PROXIMITY OPERATOR LEVEL NOT CONSISTENT WITH
FIELD CODE - 'AND' OPERATOR ASSUMED 'APSULAT?) (S) '
L106          0 FILE FEDRIP
L107          0 FILE FOMAD
L108          0 FILE FOREGE
L109          0 FILE FROSTI
L110          0 FILE FSTA
L111          0 FILE GENBANK
L112          0 FILE HEALSAFE
L113          2 FILE IFIPAT
L114          0 FILE IMSDRUGNEWS
L115          0 FILE IMSPRODUCT
L116          0 FILE IMSRESEARCH
L117          0 FILE JICST-EPLUS
L118          0 FILE KOSMET
L119          0 FILE LIFESCI
L120          0 FILE MEDICONF
L121          0 FILE MEDLINE
L122          0 FILE NIOSHTIC
L123          0 FILE NTIS
L124          0 FILE NUTRACEUT
L125          0 FILE OCEAN
L126          0 FILE PASCAL
L127          0 FILE PCTGEN
L128          0 FILE PHAR
L129          0 FILE PHARMAML
L130          0 FILE PHIC
L131          0 FILE PHIN
L132          0 FILE PROMT
L133          0 FILE PROUSDDR
L134          0 FILE PS
L135          0 FILE RDISCLOSURE
L136          0 FILE SCISEARCH
L137          0 FILE SYNTHLINE
L138          0 FILE TOXCENTER
L139          5 FILE USPATFULL
L140          0 FILE USPAT2
L141          0 FILE VETB
L142          0 FILE VETU
L143          0 FILE WATER
L144          2 FILE WPIDS
L145          0 FILE WPIFV

TOTAL FOR ALL FILES
L146         33 (STARCH (W) ENCAPSULAT?) (S) (FUSION OR FUSED OR HYBRID)

=> dup rem l146
DUPLICATE IS NOT AVAILABLE IN 'ADISINSIGHT, ADISNEWS, BIOCOMMERCE, DGENE,
```

DRUGMONOG2, FEDRIP, FOREGE, GENBANK, IMSPRODUCT, IMSRESEARCH, KOSMET, MEDICONF, NUTRACEUT, PCTGEN, PHAR, PHARMAML, PROUSDDR, PS, RDISCLOSURE, SYNTHLINE'.
ANSWERS FROM THESE FILES WILL BE CONSIDERED UNIQUE
PROCESSING COMPLETED FOR L146
L147 29 DUP REM L146 (4 DUPLICATES REMOVED)

=> d l147 1-29 ibib abs

L147 ANSWER 1 OF 29 IFIPAT COPYRIGHT 2005 IFI on STN DUPLICATE 1

AN	10677875 IFIPAT;IFIUDB;IFICDB		
TITLE:	STARCH ENCAPSULATION		
INVENTOR(S):	Guan; Hanping, Ames, IA, US Keeling; Peter, Ames, IA, US		
PATENT ASSIGNEE(S):	Unassigned		
PATENT ASSIGNEE PROBABLE:	BASF CORP (Probable)		
AGENT:	BASF CORPORATION, 26 DAVIS DRIVE, RESEARCH TRIANGLE PARK, NC, 27709, US		

	NUMBER	PK	DATE
PATENT INFORMATION:	US 2004185114	A1	20040923
APPLICATION INFORMATION:	US 2003-628525		20030728

	APPLN. NUMBER	DATE	GRANTED PATENT NO. OR STATUS
CONTINUATION OF:	US 1997-941445	19970930	6107060
CONTINUATION OF:	US 2000-625406	20000725	ABANDONED

	NUMBER	DATE	
PRIORITY APPLN. INFO.:	US 1996-26855P	19960930	(Provisional)
FAMILY INFORMATION:	US 2004185114	20040923	
	US 6107060		
DOCUMENT TYPE:	Utility Patent Application - First Publication		
FILE SEGMENT:	CHEMICAL APPLICATION		

PARENT CASE DATA:

This application claims priority to provisional patent application serial No. 60/026,855 filed Sep. 30, 1996. Said provisional application is incorporated herein by reference to the extent not inconsistent herewith.

NUMBER OF CLAIMS: 20 12 Figure(s).
DESCRIPTION OF FIGURES:
FIG. 1a shows the plasmid pEXS114 which contains the synthetic GFP (Green Fluorescent Protein) subcloned into pBSK from Stratagene.
FIG. 1b shows the plasmid pEXS115.
FIG. 2a. shows the wvaxy gene with restriction sites subcloned into a commercially available plasmid.
FIG. 2b shows the p ET-21A plasmid commercially available from Novagen having the GFP fragment from pEXS115 subcloned therein.
FIG. 3a shows pEXS114 subcloned into pEXSWX, and the GFP-FLWX map.
FIG. 3b shows the GFP-Bam HIWX plasmid.
FIG. 4 shows the SGFP fragment of pEXS115 subcloned into pEXSWX, and the GFP-NcoWX map.
FIG. 5 shows a linear depiction of a plasmid that is adapted for use in monocots.
FIG. 6 shows the plasmid pEXS52.
FIG. 7 shows the six introductory plasmids used to form pEXS51 and pEX560; FIG. 7a shows pEXS adh1. FIG. 7b shows pEXS adh1nos3'. FIG. 7c shows pEXS33. FIG. 7d shows pEXS10zp. FIG. 7e shows pEXS10zp-adh1. FIG. 7f shows pEXS10zp-adh1-nos3'.
FIGS. 8a and 8b show the plasmids pEXS50 and pEXS51, respectively, containing the MS-SIII gene which is a starchsoluble synthase gene.
FIG. 9a shows the plasmid pEXS60 which excludes the intron shown in pEXS50, and

FIG. 9b shows the plasmid pEXS61 which excludes the intron shown in pEXS60.

AB Hybrid polypeptides are provided formed with encapsulating regions from genes that encode for anabolic proteins. More particularly, the present invention relates to recombinant nucleic acid molecules that code for genes which encapsulate an attached protein within a matrix; preferably, these genes encapsulate a desired ("payload") polypeptide within starch, and more specifically within the starch granule matrix. Expression vectors comprising these recombinant nucleic acid molecules, and hosts therefor, and more specifically the starchbearing portions of such hosts, transformed with such vectors, are also provided. Preferably, grain containing a foreign protein encapsulated within the starch is provided, useful to produce mammalian, fish and avian food. The invention also encompasses methods of producing purified protein from starch and particularly from starch granules, and industrial uses of such protein.

CLMN 20 12 Figure(s).

FIG. 1a shows the plasmid pEXS114 which contains the synthetic GFP (Green Fluorescent Protein) subcloned into pBSK from Stratagene.

FIG. 1b shows the plasmid pEXS115.

FIG. 2a. shows the wvaxy gene with restriction sites subcloned into a commercially available plasmid.

FIG. 2b shows the p ET-21A plasmid commercially available from Novagen having the GFP fragment from pEXS115 subcloned therein.

FIG. 3a shows pEXS114 subcloned into pEXSWX, and the GFP-FLWX map.

FIG. 3b shows the GFP-Bam HIWX plasmid.

FIG. 4 shows the SGFP fragment of pEXS115 subcloned into pEXSWX, and the GFP-NcoWX map.

FIG. 5 shows a linear depiction of a plasmid that is adapted for use in monocots.

FIG. 6 shows the plasmid pEXS52.

FIG. 7 shows the six introductory plasmids used to form pEXS51 and pEX560; FIG. 7a shows pEXS adh1. FIG. 7b shows pEXS adh1nos3'. FIG. 7c shows pEXS33. FIG. 7d shows pEXS10zp. FIG. 7e shows pEXS10zp-adh1. FIG. 7f shows pEXS10zp-adh1-nos3'.

FIGS. 8a and 8b show the plasmids pEXS50 and pEXS51, respectively, containing the MS-SIII gene which is a starchsoluble synthase gene.

FIG. 9a shows the plasmid pEXS60 which excludes the intron shown in pEXS50, and FIG. 9b shows the plasmid pEXS61 which excludes the intron shown in pEXS60.

L147 ANSWER 2 OF 29 USPATFULL on STN

ACCESSION NUMBER: 2004:140285 USPATFULL

TITLE: Glucan chain length domains

INVENTOR(S): Commuri, Padma, Ankeny, IA, UNITED STATES
Keeling, Peter L., Ames, IA, UNITED STATES
Ramirez, Nona, Ames, IA, UNITED STATES
McKean, Angela, Ames, IA, UNITED STATES
Gao, Zhong, Ames, IA, UNITED STATES
Guan, Hanping, Ames, IA, UNITED STATES

	NUMBER	KIND	DATE	
PATENT INFORMATION:	US 2004107461	A1	20040603	
APPLICATION INFO.:	US 2002-109048	A1	20020329	(10)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2001-279720P	20010330 (60)

DOCUMENT TYPE: Utility

FILE SEGMENT: APPLICATION

LEGAL REPRESENTATIVE: NIXON & VENDERHYE P.C., 8th Floor, 1100 North Glebe Road, Arlington, VA, 22201-4714

NUMBER OF CLAIMS: 53

EXEMPLARY CLAIM: 1

NUMBER OF DRAWINGS: 22 Drawing Page(s)

LINE COUNT: 12564

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The invention relates to a method for changing the glucan chain lengths using fusion protein domains of various starch synthase enzymes in any

starch or starch granule producing organism. The invention relates to identification of a GLucan ASSociation domain (herein after referred to as "GLASS" domain) of granule bound starch synthase (GBSS) used in combination with any other GLYcosyl TRransferase domain otherwise referred to as pfam00534-catalytic domain (herein after referred to as "GLYTR" domain) of one or more of any of the other starch synthase enzymes. The invention relates to identifying and using the new and surprising discovery that starch synthases are composed of at least two distinct functional domains herein after labeled as "GLASS" and "GLYTR". More specifically, this invention relates to the genetic constructs that encode the fusions of the above domains and to the plants transformed with said constructs. The method of invention can thus be used in particular to provide a modified profile of starch granule associated starch synthase (SS) enzymes and by which modified glucan chain lengths of amylopectin and hence, modified starches and or complexes will be generated. This can be done in any organism and more particularly any plant that stores or synthesizes starch in any of its parts, such as potato, sweet potato, cassaya, pea, taro, banana, yam and cereal crops such as rice, maize, wheat, barley, oats, and sorghum.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L147 ANSWER 3 OF 29 USPATFULL on STN
ACCESSION NUMBER: 2003:243884 USPATFULL
TITLE: Thermotolerant phytase for animal feed
INVENTOR(S): Lanahan, Michael B., Morrisville, NC, UNITED STATES
Betts, Scott, Durham, NC, UNITED STATES
PATENT ASSIGNEE(S): Syngenta Participations AG, Basel, SWITZERLAND (U.S. corporation)

	NUMBER	KIND	DATE	
PATENT INFORMATION:	US 2003170293	A1	20030911	
APPLICATION INFO.:	US 2002-334671	A1	20021230	(10)

	NUMBER	DATE	
PRIORITY INFORMATION:	US 2001-344476P	20011228	(60)

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: ROPES & GRAY LLP, ONE INTERNATIONAL PLACE, BOSTON, MA, 02110-2624
NUMBER OF CLAIMS: 56
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 10 Drawing Page(s)
LINE COUNT: 4346
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The invention provides a synthetic phytase polynucleotide which is optimized for expression in plants and which encodes at thermotolerant phytase, as well as isolated thermotolerant phytase enzyme. Also provided are feed or food products comprising a thermotolerant phytase, and transgenic plants which express the thermotolerant phytase. Further provided are methods for making and using thermotolerant phytases, e.g., a method of using a thermotolerant phytase in feed and food processing.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L147 ANSWER 4 OF 29 USPATFULL on STN
ACCESSION NUMBER: 2003:196073 USPATFULL
TITLE: Self-processing plants and plant parts
INVENTOR(S): Lanahan, Michael B., Research Triangle Park, NC, UNITED STATES
Basu, Shib Sankar, Apex, NC, UNITED STATES
Batie, Christopher J., Durham, NC, UNITED STATES
Chen, Wen, Cary, NC, UNITED STATES
Craig, Joyce, Pittsboro, NC, UNITED STATES
Kinkema, Mark, Durham, NC, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 2003135885	A1	20030717
APPLICATION INFO.:	US 2002-228063	A1	20020827 (10)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2001-315281P	20010827 (60)

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: HALE & DORR LLP, THE WILLARD OFFICE BUILDING, 1455 PENNSYLVANIA AVE, NW, WASHINGTON, DC, 20004
NUMBER OF CLAIMS: 234
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 24 Drawing Page(s)
LINE COUNT: 8257
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The invention provides polynucleotides, preferably synthetic polynucleotides, which encode processing enzymes that are optimized for expression in plants. The polynucleotides encode mesophilic, thermophilic, or hyperthermophilic processing enzymes, which are activated under suitable activating conditions to act upon the desired substrate. Also provided are "self-processing" transgenic plants, and plant parts, e.g., grain, which express one or more of these enzymes and have an altered composition that facilitates plant and grain processing. Methods for making and using these plants, e.g., to produce food products having improved taste and to produce fermentable substrates for the production of ethanol and fermented beverages are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L147 ANSWER 5 OF 29 WPIDS COPYRIGHT 2005 THE THOMSON CORP on STN
ACCESSION NUMBER: 2003-607980 [57] WPIDS
DOC. NO. CPI: C2003-165707
TITLE: Preparing a thermotolerant phytase for preparing animal feed or human food by expressing in a plant cell an expression cassette comprising a promoter operably linked to a nucleic acid molecule encoding a thermotolerant phytase.
DERWENT CLASS: B04 C06 D13 D16
INVENTOR(S): BETTS, S; LANAHAN, M B
PATENT ASSIGNEE(S): (SYGN) SYNGENTA PARTICIPATIONS AG
COUNTRY COUNT: 102
PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG
WO 2003057248	A1	20030717	(200357)*	EN	157
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SI SK SL SZ TR TZ UG ZM ZW					
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW					
US 2003170293	A1	20030911	(200367)		
AU 2002364919	A1	20030724	(200421)		
EP 1474165	A1	20041110	(200473)	EN	
R: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR					
BR 2002015406	A	20041109	(200482)		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2003057248	A1	WO 2002-US41787	20021230
US 2003170293	A1 Provisional	US 2001-344476P	20011228

		US 2002-334671	20021230
AU 2002364919	A1	AU 2002-364919	20021230
EP 1474165	A1	EP 2002-801222	20021230
		WO 2002-US41787	20021230
BR 2002015406	A	BR 2002-15406	20021230
		WO 2002-US41787	20021230

FILING DETAILS:

PATENT NO	KIND	PATENT NO
AU 2002364919	A1 Based on	WO 2003057248
EP 1474165	A1 Based on	WO 2003057248
BR 2002015406	A Based on	WO 2003057248

PRIORITY APPLN. INFO: US 2001-344476P 20011228; US 2002-334671 20021230

AN 2003-607980 [57] WPIDS

AB WO2003057248 A UPAB: 20030906

NOVELTY - Preparing a thermotolerant phytase comprises expressing in a plant cell an expression cassette comprising a promoter operably linked to a nucleic acid molecule encoding a thermotolerant phytase which retains at least 40% activity after 30 minutes at 60 deg. C and has a specific activity of greater than 200 U/mg at pH 4.5 and 37 deg. C.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(1) preparing animal feed;

(2) an animal feed;

(3) a heat-treated animal feed mixture;

(4) an animal feed composition comprising the phytase;

(5) an enzyme feed additive comprising the thermotolerant phytase;

(6) preparing a thermotolerant phytase containing composition for feed formulation;

(7) a lyophilized composition;

(8) reducing the feed conversion ratio and increasing weight gain;

(9) improving reducing feed conversion ratios or increasing weight gain of animals fed diets with inorganic phosphate at levels below 0.45%;

(10) minimizing dietary requirements of phosphorus in an animal;

(11) enhancing organic phosphate utilization from organic phosphorus sources in feed for an animal;

(12) decreasing the phosphate levels in excreta from an animal;

(13) improving the processing of grain;

(14) improving the nutritive value of a processed grain product or a method of processing grain;

(15) improving the nutritive value of animal feed and human food;

(16) a food composition comprising the thermotolerant phytase;

(17) preparing human food;

(18) a treated human food, prepared by (17);

(19) a food additive comprising the thermotolerant phytase;

(20) preparing a transformed plant which expresses the thermotolerant phytase; and

(21) a transformed plant comprising an expression cassette comprising a promoter operably linked to the nucleic acid molecule encoding the thermotolerant phytase.

ACTIVITY - Anabolic.

No biological data given.

MECHANISM OF ACTION - None given.

USE - The method is useful for preparing a thermotolerant phytase for preparing animal feed or human food. Other methods are useful for reducing the feed conversion ratio and increasing weight gain, improving reducing feed conversion rations or increasing weight gain of animals fed diets with inorganic phosphate at levels below 0.45%, minimizing dietary requirements of phosphorus in an animal, enhancing the utilization of phosphorus present in animal feed, enhancing organic phosphorus utilization from organic phosphorus sources in animal feed, decreasing the phosphate levels in excreta from an animal, improving the processing of grain, improving the nutritive value of processed grain product or a method of processing grain, improving the nutritive value of animal feed

and human food, and preparing a transformed plant which expresses a thermotolerant phytase (claimed).
Dwg.0/8

L147 ANSWER 6 OF 29 IFIPAT COPYRIGHT 2005 IFI on STN DUPLICATE 2

AN	03372399 IFIPAT;IFIUDB;IFICDB
TITLE:	**STARCH ENCAPSULATION**; **FUSION** PROTEIN OF A **STARCH-ENCAPSULATING** REGION FROM A STARCH-BINDING ENZYME **FUSED** TO A PAYLOAD POLYPEPTIDE WHICH IS NOT ENDOGENOUS TO REGION; ANIMAL FEEDS; VETERINARY MEDICINE
INVENTOR(S):	Guan; Hanping, Ames, IA Keeling; Peter, Ames, IA
PATENT ASSIGNEE(S):	ExSeed GEnetics, L.L.C., Ames, IA
PRIMARY EXAMINER:	Minnifield, Nita
ASSISTANT EXAMINER:	Zaghmout, Ousama M-Faiz
AGENT:	Nixon & Vanderhye P.C.

	NUMBER	PK	DATE
PATENT INFORMATION:	US 6107060	A	20000822
APPLICATION INFORMATION:	US 1997-941445		19970930
EXPIRATION DATE:	30 Sep 2017		

	NUMBER	DATE	
PRIORITY APPLN. INFO.:	US 1996-26855P	19960930	(Provisional)
FAMILY INFORMATION:	US 6107060	20000822	
DOCUMENT TYPE:	Utility REASSIGNED		
FILE SEGMENT:	CHEMICAL GRANTED		

MICROFILM REEL NO:	008944	FRAME NO:	0884
	013862		0682
	013868		0047
NUMBER OF CLAIMS:	20		
GRAPHICS INFORMATION:	12 Drawing Sheet(s), 9 Figure(s).		

AB Hybrid polypeptides are provided formed with encapsulating regions from genes that encode for anabolic proteins. More particularly, the present invention relates to recombinant nucleic acid molecules that code for genes which encapsulate an attached protein within a matrix; preferably, these genes encapsulate a desired ("payload") polypeptide within starch, and more specifically within the starch granule matrix. Expression vectors comprising these recombinant nucleic acid molecules, and hosts therefor, and more specifically the starch-bearing portions of such hosts, transformed with such vectors, are also provided. Preferably, grain containing a foreign protein encapsulated within the starch is provided, useful to produce mammalian, fish and avian food. The invention also encompasses methods of producing purified protein from starch and particularly from starch granules, and industrial uses of such protein.

CLMN 20

GI 12 Drawing Sheet(s), 9 Figure(s).

L147 ANSWER 7 OF 29 BIOTECHDS COPYRIGHT 2005 THE THOMSON CORP. on STN DUPLICATE 3

ACCESSION NUMBER:	1998-06944 BIOTECHDS
TITLE:	**Hybrid** polypeptide comprising **starch-encapsulating** region and protein; fusion protein production following vector expression in rice host cell and transgenic plant propagation for modified starch production
AUTHOR:	Keeling P; Guan H
PATENT ASSIGNEE:	Exseed-Genetics
LOCATION:	Ames, IA, USA
PATENT INFO:	WO 9814601 9 Apr 1998
APPLICATION INFO:	WO 1997-US17555 30 Sep 1997

PRIORITY INFO: US 1996-26855 30 Sep 1996
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: WPI: 1998-240100 [21]
AN 1998-06944 BIOTECHDS
AB A **hybrid** protein containing a **starch-encapsulating** region (SER) **fused** to a payload protein, is new. Also claimed are: a recombinant nucleic acid (NA) encoding the **hybrid** protein; an expression vector containing the NA; a cell, preferably a plant cell (e.g. rice (Oryza sativa)), transformed with the NA and capable of expressing it; a plant propagated from the cell; a seed from the plant which expresses the recombinant molecule; and a modified starch derived from the cells containing the payload protein. The SER is derived from an enzyme selected from soluble starch-synthase-I, -II or -III, granule-bound synthase, branching enzyme-I, -IIa or IIBb or glucoamylase (EC-3.2.1.3) proteins. The **hybrid** protein containing a cleavage site between the SER and the payload protein. The protein is preferably in a bacterial, monocotyledon or dicotyledon plant or animal host. The **hybrid** protein can be used to make modified starches containing the payload protein, selected from e.g. hormones, growth factors, antibodies, enzymes, dyes and immunoglobulins etc. The modified starch can also be used to provide grain feeds enriched in amino acids. (156pp)

L147 ANSWER 8 OF 29 CROPU COPYRIGHT 2005 THE THOMSON CORP on STN
ACCESSION NUMBER: 1992-86519 CROPU Q G
TITLE: Control of Lepidopterous Pests on Cabbage with Starch-Encapsulated Microbial Formulations, 1991.
AUTHOR: Eastman C E; Oloumi Sadeghi H; McGuire M R
LOCATION: Champaign; Peoria, Ill., USA
SOURCE: Insectic.Acaric.Tests (17, 84-85, 1992) 1 Tab. 2 Ref.
AVAIL. OF DOC.: University of Illinois, 607 East Peabody Drive, Champaign, IL 61820, U.S.A.
DOCUMENT TYPE: Journal
LANGUAGE: English
FIELD AVAIL.: LA; CT
AN 1992-86519 CROPU Q G
AB Hancock **Hybrid** cabbages were transplanted May 30. Bacillus thuringiensis var. kurstaki preparations applied June 28, July 18 and 26 and August 1 were: SE (**starch encapsulated**) preparation Nos. 1, 2 and 3, either alone or + 1% charcoal; comparison was made with Dipel 2X WP. All contained the same amount of Bt, and were applied with Triton CS-7 6 oz/A in 30 gal/A sprays. All products reduced Pieris rapae, Plutella xylostella and Trichoplusia ni populations when rated July 1. The SE formulations were superior to Dipel against diamondback moth after 4 sprays (rated August 4-8), but were equal to Dipel against imported cabbageworm and cabbage looper. No treatment gave sufficient protection from insect damage for production of market-quality heads. SE Number 3 + charcoal caused mild spotting on wrapper leaves. (No EX).

L147 ANSWER 9 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAW56492 Protein DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: N-PSDB: AAV29760
DESCRIPTION: Zea mays soluble starch synthase fragment.
AN AAW56492 Protein DGENE

AB The sequence is that encoded by a fragment of the soluble starch synthase gene. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 10 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAW56485 Protein DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: N-PSDB: AAV29753
DESCRIPTION: Oryza sativa starch (bacterial glycogen) synthase.
AN AAW56485 Protein DGENE
AB The sequence is that of starch (bacterial glycogen) which is encoded by the waxy gene. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 11 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAW56484 Protein DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: N-PSDB: AAV29752
DESCRIPTION: Zea mays waxy gene glucosyl transferase.
AN AAW56484 Protein DGENE
AB The sequence is that of maize glucosyl transferase which is encoded by the waxy gene. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 12 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAW56486 Protein DGENE

TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: N-PSDB: AAV29754#
DESCRIPTION: Zea mays soluble starch synthase IIa.
AN AAW56486 Protein DGENE
AB The sequence is that of soluble starch synthase IIa. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 13 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAW56487 Protein DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: N-PSDB: AAV29755
DESCRIPTION: Zea mays soluble starch synthase IIb.
AN AAW56487 Protein DGENE
AB The sequence is that of soluble starch synthase IIb. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 14 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAW56488 Protein DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: N-PSDB: AAV29756
DESCRIPTION: Zea mays soluble starch synthase I.

AN AAW56488 Protein DGENE
AB The sequence is that of soluble starch synthase I. It can be used in the production of a **hybrid** polypeptide comprising a **starch -encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 15 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAW56489 Protein DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: N-PSDB: AAV29757
DESCRIPTION: Zea mays starch branching enzyme II.
AN AAW56489 Protein DGENE
AB The sequence is that of starch branching enzyme II. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 16 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAW56490 Protein DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: N-PSDB: AAV29758
DESCRIPTION: Zea mays starch branching enzyme I.
AN AAW56490 Protein DGENE
AB The sequence is that of starch branching enzyme I. It can be used in the production of a **hybrid** polypeptide comprising a **starch -encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 17 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAW56491 Protein DGENE
TITLE: **Hybrid** polypeptide comprising **starch-**

encapsulating region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: N-PSDB: AAV29759
DESCRIPTION: Zea mays starch synthase.
AN AAW56491 Protein DGENE
AB The sequence is that of maize starch synthase from pEXS52. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 18 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29759 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: P-PSDB: AAW56491
DESCRIPTION: Zea mays pEXS52 starch synthase gene.
AN AAV29759 DNA DGENE
AB The sequence is that of the starch synthase coidng region from pEXS52. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 19 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29760 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: P-PSDB: AAW56492
DESCRIPTION: Zea mays soluble starch synthase gene fragment.
AN AAV29760 DNA DGENE

AB The sequence is that of a fragment of the soluble starch synthase gene. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 20 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29752 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: P-PSDB: AAW56484
DESCRIPTION: Zea mays waxy gene.
AN AAV29752 DNA DGENE
AB The sequence is that of the waxy gene which codes for glucosyl transferase. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 21 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29753 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: P-PSDB: AAW56485
DESCRIPTION: Oryza sativa waxy gene.
AN AAV29753 DNA DGENE
AB The sequence is that of the waxy gene which codes for starch synthase. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 22 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29754 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-**

encapsulating region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: P-PSDB: AAW56486
DESCRIPTION: Zea mays soluble starch synthase IIa gene.
AN AAV29754 DNA DGENE
AB The sequence is that of the soluble starch synthase IIa gene. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 23 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29755 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: P-PSDB: AAW56487
DESCRIPTION: Zea mays soluble starch synthase IIb gene.
AN AAV29755 DNA DGENE
AB The sequence is that of the soluble starch synthase IIb gene. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 24 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29756 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: P-PSDB: AAW56488
DESCRIPTION: Zea mays soluble starch synthase I gene.
AN AAV29756 DNA DGENE

AB The sequence is that of the soluble starch synthase I gene. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 25 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29757 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N) EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: P-PSDB: AAW56489
DESCRIPTION: Zea mays starch branching enzyme II gene.
AN AAV29757 DNA DGENE
AB The sequence is that of the starch branching enzyme II gene. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 26 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29758 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N) EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
CROSS REFERENCES: P-PSDB: AAW56490
DESCRIPTION: Zea mays starch branching enzyme I gene.
AN AAV29758 DNA DGENE
AB The sequence is that of the starch branching enzyme I gene. It can be used in the production of a **hybrid** polypeptide comprising a **starch-encapsulating** region (SER) **fused** to a payload protein. The **hybrid** polypeptide can be used to make modified starches comprising the payload protein, selected from, e.g. hormones, growth factors, antibodies, enzymes, dyes, immunoglobulins, etc. The modified starch can also be used to provide grain feeds enriched in amino acids. By encapsulating the payload protein in starch, it is more resistant to degradation by stomach acids.

L147 ANSWER 27 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29749 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g.

producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
DESCRIPTION: Synthetic **starch-encapsulating** region **fusion** vector PCR primer.
AN AAV29749 DNA DGENE
AB The sequence is that of PCR primer EXS73 which was used in the construction of a **starch-encapsulating** region (SER) **fusion** vector.

L147 ANSWER 28 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29751 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
DESCRIPTION: Synthetic **starch-encapsulating** region **fusion** vector PCR primer.
AN AAV29751 DNA DGENE
AB The sequence is that of PCR primer EXS75 which was used in the construction of a **starch-encapsulating** region (SER) **fusion** vector.

L147 ANSWER 29 OF 29 DGENE COPYRIGHT 2005 The Thomson Corp on STN
ACCESSION NUMBER: AAV29750 DNA DGENE
TITLE: **Hybrid** polypeptide comprising **starch-encapsulating** region and protein - useful for, e.g. producing protein(s) resistant to degradation by stomach acids
INVENTOR: Guan H; Keeling P
PATENT ASSIGNEE: (EXSE-N)EXSEED GENETICS LLC.
PATENT INFO: WO 9814601 A1 19980409 156p
APPLICATION INFO: WO 1997-US17555 19970930
PRIORITY INFO: US 1996-26855 19960930
DOCUMENT TYPE: Patent
LANGUAGE: English
OTHER SOURCE: 1998-240100 [21]
DESCRIPTION: Synthetic **starch-encapsulating** region **fusion** vector PCR primer.
AN AAV29750 DNA DGENE
AB The sequence is that of PCR primer EXS74 which was used in the construction of a **starch-encapsulating** region (SER) **fusion** vector.

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☐ 1. Document ID: US 20050015830 A1

L6: Entry 1 of 31 File: PGPB Jan 20, 2005

DOCUMENT-IDENTIFIER: US 20050015830 A1
TITLE: Method of protein production in plants

Detail Description Paragraph:
[0108] The genes of interest that can be expressed and isolated using our invention include, but are not limited to: starch modifying enzymes (starch synthase, starch phosphorylation enzyme, debranching enzyme, starch branching enzyme, starch branching enzyme 11, granule bound starch synthase), sucrose phosphate synthase, sucrose phosphorylase, polygalacturonase, polyfructan sucrase, ADP glucose pyrophosphorylase, cyclodextrin glycosyltransferase, fructosyl transferase, glycogen synthase, pectin esterase, aprotinin, avidin, bacterial levansucrase, E. coli gIgA protein, MAPK4 and orthologues, nitrogen assimilation/methabolism enzyme, glutamine synthase, plant osmotin, 2S albumin, thaumatin, site-specific recombinase/integrase (FLP, Cre, R recombinase, Int, SSVI Integrase R, Integrase phiC31, or an active fragment or variant thereof), isopentenyl transferase, Sca M5 (soybean calmodulin), coleopteran type toxin or an insecticidally active fragment, ubiquitin conjugating enzyme (E2) fusion proteins, enzymes that metabolise lipids, amino acids, sugars, nucleic acids and polysaccharides, superoxide dismutase, inactive proenzyme form of a protease, plant protein toxins, traits altering fiber in fiber producing plants, Coleopteran active toxin from Bacillus thuringiensis (Bt2 toxin, insecticidal crystal protein (ICP), CryIC toxin, delta endotoxin, polyopeptide toxin, protoxin etc.), insect specific toxin AaIT, cellulose degrading enzymes, E1 cellulase from Acidothermus celluloticus, lignin modifying enzymes, cinnamoyl alcohol dehydrogenase, trehalose-6-phosphate synthase, enzymes of cytokinin metabolic pathway, HMG-CoA reductase, E. coli inorganic pyrophosphatase, seed storage protein, Erwinia herbicola lycopen synthase, ACC oxidase, pTOM36 encoded protein, phytase, ketohydrolase, acetoacetyl CoA reductase, PHB (polyhydroxybutanoate) synthase, acyl carrier protein, napin, EA9, non-higher plant phytoene synthase, pTOM5 encoded protein, ETR (ethylene receptor), plastidic pyruvate phosphate dikinase, nematode-inducible transmembrane pore protein, trait enhancing photosynthetic or plastid function of the plant cell, stilbene synthase, an enzyme capable of hydroxylating phenols, catechol dioxygenase, catechol 2,3-dioxygenase, chloromuconate cycloisomerase, anthranilate synthase, Brassica AGL15 protein, fructose 1,6-biphosphatase (FBPase), AMV RNA3, PVY replicase, PLRV replicase, potyvirus coat protein, CMV coat protein, TMV coat protein, luteovirus replicase, MDMV messenger RNA, mutant geminiviral replicase, Umbellularia californica C12:0 preferring acyl-ACP thioesterase, plant C10 or C12:0 preferring acyl-ACP thioesterase, C14:0 preferring acyl-ACP thioesterase (luxD), plant synthase factor A, plant synthase factor B, .DELTA.6-desaturase, protein having an enzymatic activity in the peroxysomal .beta.-oxidation of fatty acids in plant cells, acyl-CoA oxidase, 3-ketoacyl-CoA thiolase, lipase, maize acetyl-CoA-carboxylase, 5-enolpyruvylshikimate-3-phosphate synthase (EPSP), phosphinothricin acetyl transferase (BAR, PAT), CP4 protein, ACC deaminase, protein having

posttranslational cleavage site, DHPS gene conferring sulfonamide resistance, bacterial nitrilase, 2,4D monooxygenase, acetolactate synthase or acetohydroxyacid synthase (ALS, AHAS), polygalacturonase, Taq polymerase, bacterial nitrilase, many other enzymes of bacterial or phage including restriction endonucleases, methylases, DNA and RNA ligases, DNA and RNA polymerases, reverse trascryptases, nucleases (Dnases and RNAses), phosphatases, transferases etc.

☐ 2. Document ID: US 20040216188 A1

L6: Entry 2 of 31 File: PGPB Oct 28, 2004

DOCUMENT-IDENTIFIER: US 20040216188 A1
TITLE: Isoforms of strach branching enzyme II (SBE-IIA and SBE-IIB) from wheat

Detail Description Paragraph:
[0155] pW.times.GS+ (FIG. 13) comprising a maize granule bound starch synthase gene (Shure el al 1983) promoter-GUS-Nos fusion was obtained as a gift to Unilever Research from Sue Wessler (University of Georgia, Athens, USA) and may be obtained on request from that source. The promoter in pW.times.GS+is approximately 1.5 kb in length and represents a truncated version of a similar, but larger promoter fragment described in Russell & Fromm (1997). The sequence of the promoter (HindIII-BarmH1 fragment) in pWxGS+ is presented in FIG. 13A (SEQ ID No: 55).

☐ 3. Document ID: US 20040204579 A1

L6: Entry 3 of 31 File: PGPB Oct 14, 2004

DOCUMENT-IDENTIFIER: US 20040204579 A1
TITLE: Nucleic acid molecules encoding enzymes from wheat which are involved in starch synthesis

Detail Description Paragraph:
[0193] The functionality of the soluble starch synthase was tested by cotransformation of the plasmids pTaSSS.DELTA.188 and pACAG in the mutant G6MD2. The plasmid pTaSSS.DELTA.188 comprise nucleotides 188-2239 of the 2239 bp cDNA sequence, which code for the soluble starch synthase. The cDNA is inserted as Eco RI/Xho I fragment in the polylinker region of the pBluescript vector. (Stratagene). This allows the N-terminus of the .alpha.-peptide of the beta-galactosidase encoded by the vector to be fused in frame with a part of the soluble starch synthase.

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4. Document ID: US 20040185114 A1

L6: Entry 4 of 31 File: PGPB Sep 23, 2004

DOCUMENT-IDENTIFIER: US 20040185114 A1
TITLE: Starch encapsulation

Summary of Invention Paragraph:
[0028] The starch-encapsulating region of the hybrid polypeptide may be a starch-encapsulating region of any starch-binding enzyme known to the art, e.g. an enzyme selected from the group consisting of soluble starch synthase I, soluble starch synthase II, soluble starch synthase III, granule-bound starch synthase, branching enzyme I, branching enzyme IIa, branching enzyme IIBb and glucoamylase polypeptides.

CLAIMS:

5. The hybrid polypeptide of claim 1 wherein said starch-encapsulating region is the starch-encapsulating region of an enzyme selected from the group consisting of soluble starch synthase I, soluble starch synthase II, soluble starch synthase III, granule-bound starch synthase, branching enzyme I, branching enzyme Ia, branching enzyme IIBb and glucoamylase polypeptides.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

5. Document ID: US 20040107461 A1

L6: Entry 5 of 31 File: PGPB Jun 3, 2004

DOCUMENT-IDENTIFIER: US 20040107461 A1
TITLE: Glucan chain length domains

Abstract Paragraph:
The invention relates to a method for changing the glucan chain lengths using fusion protein domains of various starch synthase enzymes in any starch or starch granule producing organism. The invention relates to identification of a GLucan ASSociation domain (herein after referred to as "GLASS" domain) of granule bound starch synthase (GBSS) used in combination with any other GLYcosyl TRransferase domain otherwise referred to as pfam00534-catalytic domain (herein after referred to as "GLYTR" domain) of one or more of any of the other starch synthase enzymes. The invention relates to identifying and using the new and surprising discovery that starch synthases are composed of at least two distinct functional domains herein after labeled as "GLASS" and "GLYTR". More specifically, this invention relates to the genetic constructs that encode the fusions of the above domains and to the plants transformed with said constructs. The method of invention can thus be used in particular to provide a modified profile of starch granule associated starch synthase (SS) enzymes and by which modified glucan chain lengths of amylopectin and hence, modified starches and or complexes will be generated. This can be done in any organism and more particularly any plant that stores or synthesizes starch in any of its parts, such as potato, sweet potato, cassaya, pea,

taro, banana, yam and cereal crops such as rice, maize, wheat, barley, oats, and sorghum.

Summary of Invention Paragraph:
[0008] However, none of these above mentioned patents describe the combination of different domains of SS enzymes, for example starch association domain ("GLASS" domain) of one enzyme, like GBSS to the catalytic domain ("GLYTR" domain) of another, for example SSIIa, in order to bring a modification to the structure of starch. Surprisingly, the applicants discovery of threading SS enzymes using 3D-PSSM (three-dimensional position-specific scoring matrix) program (Kelley et al., 2000, J. Mol. Boil. 299:499-520) to predict three dimensional structure of SS enzymes and the sequence comparisons revealed two distinct domains for each one of these enzymes (herein after referred to as "GLASS" and "GLYTR"). 3D-PSSM uses structural alignments of homologous proteins of similar three-dimensional structure in the structural classification of proteins (SCOP) database to obtain a structural equivalence of residues. These equivalences are used to extend multiply aligned sequences obtained by standard sequence searches. The resulting large-superfamily based multiple alignment is converted into a PSSM (position specific scoring matrix). Combined with secondary structure matching and solvation potentials, 3D-PSSM can recognize structural and functional relationships beyond state-of the-art sequence methods (Kelly et al., 2000, J. Mol. Biol. 299:499-520). Analysis through 3D-PSSM revealed a conserved two domain 3D structure for all maize starch synthases tested (FIG. 5). This is the first ever report in the scientific literature to model the 3D structure of any starch synthases. Using ProDom database of protein domain families available at the world widee web address Toulouse.inra.fr/prodom.html, Denyer et al., 2001; J. of Plant. Physiol. 158: 479-487, showed identity to three different domains in maize SS enzymes. However, they have not identified a function to Domain I and II and reported that Domain II is also found in Yeast .alpha.-amlyase. They reported Domain III as a putative glucosyl transferase domain, but neither provided detailed information as to which group in this family that maize SS enzymes fall under, nor sequence homology or models for 3D-structure of SS protein. Present invention provides the discovery of "GLYTR" domains for all these enzymes as a catalytic domain with significant alignments (using RPS-BLAST 2.2.2; oasis_sapv1.54 database and Domain architectural retrieval tool [DART]) to the glycosyl transferase group-1 domain otherwise referred to as the pfam00534 family (FIG. 6 & Table III). Members of this family are spread across about at least 20+ groups with different mechanism of glycosyl transferase function. Members of the pfam 00534 (PI00534) family transfer UDP, ADP, GDP or CMP linked sugars to a variety of substates including glycogen. The sequence in the catalytic or "GLYTR" domains is highly conserved in starch synthases (Table IV). Furthermore, the present invention relates to the identification of "GLucan ASSociation Domain ("GLASS" Domain), peptides and nucleic acids encoding the same. Glucan chain length specificity is conserved in "GLASS" domain of each form of starch synthase and glycosyl transferase function is conserved in "GLYTR" domain. In addition, starch entrapment function is also embedded in the "GLASS" domain of GBSS and SSI. Also, via genetic means, the present invention provides for generation of starch synthase(s) with novel functionalities by combining various domains from different synthases, i.e. by mixing and matiching functional "GLYTR" and "GLASS" domains from different organisms. Thus, the present invention in particular relates to modification to starch structure by increasing the association of SSIIa, SSIIb and Du1 with the starch granules especially, by engineering entrapment of their corresponding enzymes with the starch granules, and expression and entrapment of fusion proteins of SS enzymes, for example, catalytic domains of SSIIa, SSIIb and Du1 in association with glucan binding domains of GBSS or SSI in the starch granules to bring a change in the glucan chain lengths and distribution and thereby synthesize modified starch. The present invention provides modified plants which contain altered or modified starch synthase domains or polypeptide fusions expressed inside the amyloplast stroma and become associated with the starch granules of economically important crops like maize, potato, rice, oat, wheat, barley, sweet potato, cassaya, taro, sago, yam, banana, pea, etc. These

SS enzyme fusions thus expressed will alter or influence the starch structure leading to plants with improved starch properties and modified starches with various industrial uses. Further applications and embodiments of this invention will be explained in detail herein below.

Summary of Invention Paragraph:
[0012] The invention provides the polypeptide sequence of GBSS enzymes (FIGS. 9A & 9B) that will enable the fused polypeptides of other starch synthases to become entrapped in the starch granules and be functional. The present invention provides modified starches with altered glucan chain lengths and a variety of starch synthase polypeptide domain fusions (TABLE V) to produce the same, as well as gene constructs that encode such fusions and in methods for the transformation of plants using such constructs as well as in the transformed plants thus obtained. The present invention also relates to the expression in plants of polypeptides-including SS enzymes as fusion proteins with improved affinity to starch and modified catalytic capabilities and to the in vivo and in vitro synthesis of glucan chains of modified lengths as compared to a plant producing native starch or starch produced with native starch synthases. In particular, the invention relates to the expression in plants of soluble starch synthase protein domains and/or polypeptide domains as fusion peptides with starch association domain of GBSS or SSI or any other SS enzyme. According to this invention, GBSS is any fusion protein thus generated using GBSS, for example, any SS or any other enzyme domain plus GLASS domains of GBSS and may include GLYTR domain as well. SS or Starch synthase means any starch synthesis enzyme that is present in soluble form, for eg. SSI, SSIIa, SSIIb, and SSIII.

Summary of Invention Paragraph:
[0014] The above objects are achieved by expressing a desired fusion protein of starch synthase or polypeptide that can interact with starch or starch granule in bringing a modification of glucan chain lengths.

Summary of Invention Paragraph:
[0015] By "interact with starch or starch granules" is generally meant that the fusion protein of starch synthases can modify, alter the chain length distribution of starch or modify the fine structure of starch. This interaction will result in starch or starch granules that differ from the naturally occurring plant starch in at least one property thereof, for example, glucan chain lengths, glucan composition, crystallinity, branching degree etc. Therefore, starch synthase fusion protein will influence at least one physical or chemical property of the starch.

Summary of Invention Paragraph:
[0016] Broadly, the invention relates to a method for expressing fusion proteins consisting of a desired one or more catalytic domains ("GLYTR" Domain) of one or more starch synthase or any other enzyme in association with glucan association domain ("GLASS" Domain) of GBSS or similar enzyme.

Summary of Invention Paragraph:
[0017] In addition, the invention also relates to a method for expressing fusion proteins consisting of a desired one or more catalytic domains ("GLYTR" Domain) of one or more starch synthase or any other enzyme in association with glucan association domain ("GLASS" Domain) of SSI or other similar enzymes.

Summary of Invention Paragraph:
[0018] The invention also relates to a method for expressing fusion proteins consisting of a desired domain ("GLASS" Domain) of any starch synthase enzyme from any organism fused with another desired domain of another starch synthase enzyme ("GLYTR" Domain) from the same or any other organism in any combination and vice versa.

Summary of Invention Paragraph:

[0021] The transformants of the invention expressing the starch synthase fusion proteins, may change the starch structure in different forms. For example, the starch synthases of the invention can change any one or the more of crystallinity of said starch, can change the glucan content, degree of branching, and especially the length of glucan chains in the amylopectin molecule.

Summary of Invention Paragraph:
[0024] The genes encoding the desired starch synthase polypeptide sequence may be derived from any source, including plants, animals, fungi, algae, yeasts, bacteria, and any other microorganisms. The expressed genes may be homologous or heterologous to the starch producing plant in which the fusion peptides of starch synthase are expressed.

Summary of Invention Paragraph:
[0025] A further aspect of the invention is that the genes encoding any of the starch synthase fusion polypeptides can be variants or mutants of such proteins, such as those known in the art and/or obtainable via genetic manipulations. This includes mutant enzymes with biological activity but, with altered properties in terms of altered substrate binding activity, altered substrate specificity, and finally altered kinetic properties.

Summary of Invention Paragraph:
[0026] In another aspect the present invention provides expression of fusion proteins with of the invention is that the expression of fusion proteins with the starch association domain of SSI and/or GBSS ("GLASS" Domain) which may include partial or full length catalytic domains of any starch synthases, starch branching enzymes, debranching enzymes, disproportionating enzymes, kinases, phosphorylases and any of the isoforms of above enzymes.

Summary of Invention Paragraph:
[0027] More in particular, the expression of these starch synthase fusion proteins along with the starch association domain of GBSS will lead to a "modified-starch", the subject matter of invention.

Summary of Invention Paragraph:
[0029] The above "modified starch" resulting from the expression of fusion proteins of starch synthases will have at least one of the listed below altered or improved properties as compared to the natively produced starch by a plant. The modified starch will have an altered or improved morphology, retrogradation, waterbinding or swelling potential of the granules, gel strength, adhesiveness, cohesiveness, hardness, elasticity, increased or decreased granule size, degree of branching, crystallinity, degree of cross-linking, and increased or decreased glucan chain lengths.

Summary of Invention Paragraph:
[0031] a) providing a genetic construct containing at least one or more nucleotide sequence encoding desired polypeptide sequence containing one or more catalytic domains ("GLYTR" Domain) of starch synthase fusion protein combined with at least one nucleotide sequence encoding starch association domain ("GLASS" Domain) of GBSS or SSI;

Summary of Invention Paragraph:
[0056] The present invention further provides a method of expressing a starch synthase fusion proteins or polypeptides in a plant, in which the starch synthase protein or polypeptide domains are expressed as a fusion with a glucan association domain of granule bound starch synthase. Theprotein or polypeptide of the method of the invention may be heterologous with respect to the plant in which the fusion is expressed.

Detail Description Paragraph:

[0137] I. Fusion Peptides of Starch Synthases

Detail Description Paragraph:
[0140] The present invention provides however fusion proteins made by combining or pairing various functional polypeptide domains of starch synthases to introduce a modification in the starch structure (Table V). In the present invention, the starch association domain of GBSS enzyme is fused with the functional or catalytic domains of other various SS enzymes with different and specific functionalities to introduce modifications to starch structure.

Detail Description Paragraph:
[0163] With regard to starch synthase fusion proteins, WO 98/14601 provides similar methods to generate naturally occuring starch that has been modified to comprise the payload peptide and not associated with bringing any structural changes to the starch or glucan chain lengths. The present invention is based, in part, on the further discoveries regarding SS enzymes and their constituent domains (detailed information provided herein below) and further evidence for the mechanism of protein entrapment in the starch granules. The present invention provides therefore methods for making and using `starch synthase fusion proteins` and producing transgenic plants capable of producing "structurally modified starch" or starch granules as described herein below. Such "structurally modified starch" of the present invention differs from naturally occurring starch in the plant by at least one property thereof, such as crystallinity, branching degree, glucan composition and glucan chain length.

Detail Description Paragraph:
[0183] The present invention also classifies maize .alpha.-1,4 glucan transfereases or starch synthases based on their specificities to process various lengths of .alpha.-1,4 glucan chains in the amylopectin cluster. For example, according to the present invention, SS enzymes are defined in 4 classes. `Class I` enzymes that include maize SSI and like enzymes, and preferentially elongate .alpha.-1,4 glucan chains to synthesize shorter A and B1 chains; `Class II` enzymes that include maize SSIIa and SSIIb and like enzymes, and preferentially add a glucose unit(s) to .alpha.-1,4 glucan chains to synthesize longer A and B1 chains and intermediate B2 or B3 chains; `Class III` enzymes that include maize SSIII and preferentially add a glucose unit(s) to .alpha.-1,4 glucan chains to synthesize longer A, B1, B2 and B3 chains as well as longer B3 or C chains of amylopectin. "Class IV" enzymes include GBSS and preferentially add a glucose unit(s) to .alpha.-1,4 glucan chains to synthesize longer B3 or C chains of amylopectin as well as amylose. In maize or any other crop when transformed to express or overexpress any one specific class of starch synthases described above will result in an increased number of glucan chains in that specific class. This patent application relates to modification of starch structure by introduction/entrapment of polypeptide domains of other soluble starch synthases (SSS) in addition to GBSS (in the form of GBSS+SSS enzyme fusion proteins) within the starch granule matrix. Therefore, the present invention provides new starch synthases other than GBSS or SSI within the starch granule matrix. These enzymes contain starch association domain of either GBSS or SSI as described above and herein which provides starch association properties similar to wild type GBSS or SSI while retaining the .alpha.-1,4 glucan transferase activity (catalytic activity) of either GBSS or soluble starch synthases such as GBSS, SSI, SSIIa, SSIIb, and SSIII and the like. Starches produced in plants expressing these enzymes are substantially new and novel.

Detail Description Paragraph:
[0229] 1. Both biochemical and transgenic approaches identified the same peptide domain of GBSS as the Glucan Association Domain (Herein referred to as "GLASS" domain).Without presence of this particular domain, transgenic proteins did not associate with starch present in the endosperm of maize kernels. The "GLASS" domain is separate from glycosyl transferase domain (herein referred to as "GLYTR" domain in this patent). The order in which the proteins domains were fused did not matter

for protein expression or glucan association as long as the "GLASS" domain was enclosed in the fusion protein. The present invention demonstrates that fusion protein technology of starch synthase enzymes may be applied in crop plants. Active fusion proteins were recovered with significant enzyme activity. The examples provided here demonstrate that the invention may be exemplified, without limitation, in maize crop.

CLAIMS:

38. Method of expressing a starch synthase fusion proteins or polypeptides in a plant, in which the starch synthase protein or polypeptide domains are expressed as a fusion with a glucan association domain of granule bound starch synthase.

39 A method according to any one of the preceding claims, in which the protein or polypeptide is heterologous with respect to the plant in which the fusion is expressed.

6. Document ID: US 20040107455 A1

L6: Entry 6 of 31 File: PGPB Jun 3, 2004

DOCUMENT-IDENTIFIER: US 20040107455 A1
TITLE: Precise breeding

Summary of Invention Paragraph:
[0078] In a preferred embodiment, the method comprises the LifeSupport-mediated transformation of a selected plant species with a modified P-DNA that contains an expression cassette for a fusion of the trailer sequences associated with the starch branching enzyme I and II genes.

Detail Description Paragraph:
[0353] Although the St-inh1 gene is present in unmodified potato tubers, its expression level is inadequate for full inhibition of invertase and reduced cold-induced sweetening. To increase the storage characteristics of potato, the St-inh1 gene was fused to a new tuber-enhanced promoter of the granule-bound starch synthase (GBSS) gene, which is known to promote high levels of gene expression in tubers. The GBSS promoter was isolated from the potato cultivar Russet Ranger by carrying out a PCR reaction using the forward primer 5'-GAACCATGCATCTCAATC-3' (SEQ ID NO. 70) and the reverse primer 5'-GTCAGGATCCCTACCAAGCTACAGATGAAC-3' (SEQ ID NO. 71). Sequence analysis of the amplified product cloned in pGEM-T demonstrated that this new promoter contains 658 basepairs (SEQ ID NO.: 6). The resulting promoter/gene fusion was then ligated to the 3' regulatory sequence of the potato ubiquitin gene (UbiT; SEQ ID NO.: 7), thus ensuring appropriate termination of transcription of the invertase inhibitor gene.

7. Document ID: US 20040088764 A1

L6: Entry 7 of 31 File: PGPB May 6, 2004

DOCUMENT-IDENTIFIER: US 20040088764 A1
TITLE: Processes and vectors for producing transgenic plants

Detail Description Paragraph:
[0049] The genes of interest, or fragments thereof, that can be introduced, in sense or antisense orientation, using our invention, include, but are not limited to: starch modifying enzymes (starch synthase, starch phosphorylation enzyme, debranching enzyme, starch branching enzyme, starch branching enzyme II, granule bound starch synthase), sucrose phosphate synthase, sucrose phosphorylase, polygalacturonase, polyfructan sucrase, ADP glucose pyrophosphorylase, cyclodextrin glycosyltransferase, fructosyl transferase, glycogen synthase, pectin esterase, aprotinin, avidin, bacterial levansucrase, E. coli gIgA protein, MAPK4 and orthologues, nitrogen assimilation/methabolism enzyme, glutamine synthase, plant osmotin, 2S albumin, thaumatin, site-specific recombinase/integrase (FLP, Cre, R recombinase, Int, SSVI Integrase R, Integrase phiC31, or an active fragment or variant thereof, isopentenyl transferase, Sca M5 (soybean calmodulin), coleopteran type toxin or an insecticidally active fragment, ubiquitin conjugating enzyme (E2) fusion proteins, enzymes that metabolise lipids, amino acids, sugars, nucleic acids and polysaccharides, superoxide dismutase, inactive proenzyme form of a protease, plant protein toxins, traits altering fiber in fiber producing plants, Coleopteran active toxin from Bacillus thuringiensis (Bt2 toxin, insecticidal crystal protein (ICP), CrylC toxin, delta endotoxin, polyopeptide toxin, protoxin etc.), insect specific toxin AalT, cellulose degrading enzymes, E1 cellulase from Acidothermus celluloticus, lignin modifying enzymes, cinnamoyl alcohol dehydrogenase, trehalose-6-phosphate synthase, enzymes of cytokinin metabolic pathway, HMG-CoA reductase, E. coli inorganic pyrophosphatase, seed storage protein, Erwinia herbicola lycopen synthase, ACC oxidase, pTOM36 encoded protein, phytase, ketohydrolase, acetoacetyl CoA reductase, PHB (polyhydroxybutanoate) synthase, acyl carrier protein, napin, EA9, non-higher plant phytoene synthase, pTOM5 encoded protein, ETR (ethylene receptor), plastidic pyruvate phosphate dikinase, nematode-inducible transmembrane pore protein, trait enhancing photosynthetic or plastid function of the plant cell, stilbene synthase, an enzyme capable of hydroxylating phenols, catechol dioxygenase, catechol 2,3-dioxygenase, chloromuconate cycloisomerase, anthranilate synthase, Brassica AGL15 protein, fructose 1,6-biphosphatase (FBPase), AMV RNA3, PVY replicase, PLRV replicase, potyvirus coat protein, CMV coat protein, TMV coat protein, luteovirus replicase, MDMV messenger RNA, mutant geminiviral replicase, Umbellularia calfformica C12:0 preferring acyl-ACP thioesterase, plant C10 or C12:0 preferring acyl-ACP thioesterase, C14:0 preferring acyl-ACP thioesterase (luxD), plant synthase factor A, plant synthase factor B, 6-desaturase, protein having an enzymatic activity in the peroxysomal-oxidation of fatty acids in plant cells, acyl-CoA oxidase, 3-ketoacyl-CoA thiolase, lipase, maize acetyl-CoA-carboxylase, 5-enolpyruvylshikimate-3-phosphate synthase (EPSP), phosphinothricin acetyl transferase (BAR, PAT), CP4 protein, ACC deaminase, ribozyme, protein having posttranslational cleavage site, protein fusion consisting of a DNA-binding domain of Gal4 transcriptional activator and a transcriptional activation domain, a translational fusion of oleosin protein with protein of interest capable of targeting the fusion protein into the lipid phase, DHPS gene conferring sulfonamide resistance, bacterial nitrilase, 2,4-D monooxygenase, acetolactate synthase or acetohydroxyacid synthase (ALS, AHAS), polygalacturonase, bacterial nitrilase, fusion of amino terminal hydrophobic region of a mature phosphate translocator protein residing in the inner envelope membrane of the plastid with protein of interest to be targeted into said membrane etc.

8. Document ID: US 20040049810 A1

L6: Entry 8 of 31 File: PGPB Mar 11, 2004

DOCUMENT-IDENTIFIER: US 20040049810 A1
TITLE: dull1 coding for a novel starch synthase and uses thereof

Detail Description Paragraph:
[0065] In another aspect, the present invention is also directed to a fusion construct, comprising part or all of the DNA the maize starch synthase enzyme fused to DNA encoding an affinity purification peptide. The present invention is also directed to the fusion protein expressed by such fusion constructs.

9. Document ID: US 20030221213 A1

L6: Entry 9 of 31 File: PGPB Nov 27, 2003

DOCUMENT-IDENTIFIER: US 20030221213 A1
TITLE: Precise breeding

Summary of Invention Paragraph:
[0077] In a preferred embodiment, the method comprises the LifeSupport-mediated transformation of a selected plant species with a modified P-DNA that contains an expression cassette for a fusion of the trailer sequences associated with the starch branching enzyme I and II genes.

Detail Description Paragraph:
[0302] Although the St-inh1 gene is present in unmodified potato tubers, its expression level is inadequate for full inhibition of invertase and reduced cold-induced sweetening. To increase the storage characteristics of potato, the St-inh1 gene was fused to a new tuber-enhanced promoter of the granule-bound starch synthase (GBSS) gene, which is known to promote high levels of gene expression in tubers. The GBSS promoter was isolated from the potato cultivar Russet Ranger by carrying out a PCR reaction using the forward primer 5'-GAACCATGCATCTCAATC-3' (SEQ ID NO. 70) and the reverse primer 5'-GTCAGGATCCCTACCAAGCTACAGATGAAC-3' (SEQ ID NO. 71). Sequence analysis of the amplified product cloned in pGEM-T demonstrated that this new promoter contains 658 basepairs (SEQ ID NO.: 6). The resulting promoter/gene fusion was then ligated to the 3' regulatory sequence of the potato ubiquitin gene (UbiT; SEQ ID NO.: 7), thus ensuring appropriate termination of transcription of the invertase inhibitor gene.

10. Document ID: US 20030135885 A1

L6: Entry 10 of 31 File: PGPB Jul 17, 2003

DOCUMENT-IDENTIFIER: US 20030135885 A1
TITLE: Self-processing plants and plant parts

Detail Description Paragraph:
[0235] A construct encoding hyperthermophilic 797GL3 .alpha.-amylase fused to the starch encapsulating region (SER) from maize granule-bound starch synthase (waxy) was introduced and expressed in E. coli. The maize granule-bound starch synthase cDNA (SEQ ID NO:7) encoding the amino acid sequence (SEQ ID NO:8)(Klosgen RB, et al. 1986) was cloned as a source of a starch binding domain, or starch encapsulating region (SER). The full-length cDNA was amplified by RT-PCR from RNA prepared from maize seed using primers SV57 (5'AGCGAATTCATGGCGGCTCTGGCCACGT 3') (SEQ ID NO: 22) and SV58 (5'AGCTAAGCTTCAGGGCGCGGCCACGTTCT 3') (SEQ ID NO: 23) designed from GenBank Accession No. X03935. The complete cDNA was cloned into pBluescript as an EcoRI/HindIII fragment and the plasmid designated pNOV4022.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

11. Document ID: US 20030074690 A1

L6: Entry 11 of 31 File: PGPB Apr 17, 2003

DOCUMENT-IDENTIFIER: US 20030074690 A1
TITLE: Novel plastid-targeting nucleic acid sequence, a novel beta-amylase sequence, a stimulus-responsive promoter and uses thereof

Summary of Invention Paragraph:
[0023] The similarity of characteristics between chloroplasts and amyloplasts (Thomson and Whatley, 1980) is of relevance to the current invention, as it has been shown that the transit peptides from chloroplast-targeted polypeptides can import heterologous polypeptides into amyloplasts and vice versa. For example, the transit peptide from the maize granule bound starch synthase enzyme when fused to the E. coli .beta.-glucuronidase (GUS) protein will import the GUS protein not only into amyloplasts but also into chloroplasts (Klosgen and Weil, 1991).

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

12. Document ID: US 20020138876 A1

L6: Entry 12 of 31 File: PGPB Sep 26, 2002

DOCUMENT-IDENTIFIER: US 20020138876 A1
TITLE: Nucleic acid molecules encoding enzymes from wheat which are involved in starch synthesis

Detail Description Paragraph:
[0180] The functionality of the soluble starch synthase was tested by cotransformation of the plasmids pTaSSS.DELTA.188 and pACAG in the mutant G6MD2. The plasmid pTaSSS.DELTA.188 comprise nucleotides 188-2239 of the 2239 bp cDNA sequence, which code for the soluble starch synthase. The cDNA is inserted as Eco RI/Xho I fragment in the polylinker region of the pBluescript vector (Stratagene) This allows the N-terminus of the .alpha.-peptide of the beta-galactosidase encoded by the vector to be fused in frame with a part of the soluble starch synthase.

13. Document ID: US 20020029394 A1

L6: Entry 13 of 31 File: PGPB Mar 7, 2002

DOCUMENT-IDENTIFIER: US 20020029394 A1
TITLE: Homologs of starch synthase DU1

Detail Description Paragraph:
[0108] Crude, partially purified or purified enzyme, either alone or as a fusion protein, may be utilized in assays to verify over- or underexpression of functional starch synthase DU1 homolog in transgenic plants and transformed bacterial cells. Assays may be conducted under well known experimental conditions which permit optimal enzymatic activity. For example, assays for starch synthase DU1 are presented by Cao et al. (1999) Plant Physiol 120:205-216 and Myers et al. (WO 99/24575).

14. Document ID: US 6858785 B1

L6: Entry 14 of 31 File: USPT Feb 22, 2005

DOCUMENT-IDENTIFIER: US 6858785 B1
TITLE: Hybrid maize plant and seed

CLAIMS:

22. A method of producing a hybrid maize plant with modified fatty acid metabolism or modified carbohydrate metabolism comprising transforming at least one of inbred maize parent plants GE534640 and GE567914, representative samples of which have been deposited as PTA-5506 and PTA-4528 respectively, with a transgene encoding a protein selected from the group consisting of stearyl-ACP desaturase, fructosyltransferase, levansucrase, alpha-amylase, invertase and starch branching enzyme to generate an inbred maize parent plant with modified fatty acid metabolism or modified carbohydrate metabolism and crossing said inbred maize parent plants to produce said hybrid maize plant that confers modified fatty acid metabolism or modified carbohydrate metabolism.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

☐ 15. Document ID: US 6809242 B1

L6: Entry 15 of 31 File: USPT Oct 26, 2004

DOCUMENT-IDENTIFIER: US 6809242 B1
TITLE: Hybrid maize plant & seed 39K40

CLAIMS:

22. A method of producing a hybrid maize plant with modified fatty acid metabolism or modified carbohydrate metabolism comprising trnsforming at least one of inbred maize parent plants GE535658 and GE516223, representative samples of which have been deposited as PTA-5505 and PTA-5517 respectively, with a transgene encoding a protein selected from the group consisting of stearyl-ACP desaturase, fructosyltransferase, levansucrase, alpha-amylase, invertase and starch branching enzyme to generate an inbred maize parent plant with modified fatty acid metabolism or modified carbohydrate metabolism and crossing said inbred maize parent plants to produce said hybrid maize plant that confers modified fatty acid metabolism or modified carbohydrate metabolism.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

☐ 16. Document ID: US 6800796 B1

L6: Entry 16 of 31 File: USPT Oct 5, 2004

DOCUMENT-IDENTIFIER: US 6800796 B1
TITLE: Hybrid maize plant and seed

CLAIMS:

22. A method of producing a hybrid maize plant with modified fatty acid metabolism or modified carbohydrate metabolism comprising transforming at least one of inbred maize parent plants GE565937 and GE502199, representative samples of which have been deposited as and PTA-5523 and PTA-607 respectively, with a transgene encoding a protein selected from the group consisting of stearyl-ACP desaturase, fructosyltransferase, levansucrase, alpha-amylase, invertase and starch branching enzyme to generate an inbred maize parent plant with modified fatty acid metabolism or modified carbohydrate metabolism and crossing said inbred maize parent plants to produce said hybrid maize plant that confers modified fatty acid metabolism or modified carbohydrate metabolism.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

☐ 17. Document ID: US 6784347 B1

L6: Entry 17 of 31 File: USPT Aug 31, 2004

DOCUMENT-IDENTIFIER: US 6784347 B1
** See image for Certificate of Correction **
TITLE: Hybrid maize plant and seed 33R77

CLAIMS:

22. A method of producing a hybrid maize plant with modified fatty acid metabolism or modified carbohydrate metabolism comprising transforming at least one of inbred maize parent plants GE515419 and GE567914, representative samples of which have been deposited as PTA-3189 and PTA-5524 respectively, with a transgene encoding a protein selected from the group consisting of stearyl-ACP desaturase, fructosyltransferase, levansucrase, alpha-amylase, invertase and starch branching enzyme to generate an inbred maize parent plant with modified fatty acid metabolism or modified carbohydrate metabolism and crossing said inbred maize parent plants to produce said hybrid maize plant that confers modified fatty acid metabolism or modified carbohydrate metabolism.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

☐ 18. Document ID: US 6777598 B1

L6: Entry 18 of 31 File: USPT Aug 17, 2004

DOCUMENT-IDENTIFIER: US 6777598 B1
TITLE: Hybrid maize plant and seed 38J54

CLAIMS:

22. A method of producing a hybrid maize plant with modified fatty acid metabolism or modified carbohydrate metabolism comprising transforming at least one of inbred maize parent plants GE500988 and GE533415, representative samples of which have been deposited as PTA-4279 and PTA-4288 respectively, with a transgene encoding a protein selected from the group consisting of stearyl-ACP desaturase, fructosyltransferase, levansucrase, alpha-amylase, invertase and starch branching enzyme to generate an inbred maize parent plant with modified fatty acid metabolism or modified carbohydrate metabolism and crossing said inbred maize parent plants to produce said hybrid maize plant that confers modified fatty acid metabolism or modified carbohydrate metabolism.

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw De

19. Document ID: US 6759577 B1

L6: Entry 19 of 31 File: USPT Jul 6, 2004

DOCUMENT-IDENTIFIER: US 6759577 B1
** See image for Certificate of Correction **
TITLE: Hybrid maize plant and seed 37Y15

CLAIMS:

22. A method of producing a hybrid maize plant with modified fatty acid metabolism or modified carbohydrate metabolism comprising transforming at least one of inbred maize parent plants GE571367 and GE533418, representative samples of which have been deposited as PTA-5527 and PTA-5519 respectively, with a transgene encoding a protein selected from the group consisting of stearyl-ACP desaturase, fructosyltransferase, levansucrase, alpha-amylase, invertase and starch branching enzyme to generate an inbred maize parent plant with modified fatty acid metabolism or modified carbohydrate metabolism and crossing said inbred maize parent plants to produce said hybrid maize plant that confers modified fatty acid metabolism or modified carbohydrate metabolism.

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw De

20. Document ID: US 6753464 B1

L6: Entry 20 of 31 File: USPT Jun 22, 2004

DOCUMENT-IDENTIFIER: US 6753464 B1
** See image for Certificate of Correction **
TITLE: Hybrid maize plant and seed 39M27

CLAIMS:

22. A method of producing a hybrid maize plant with modified fatty acid metabolism or modified carbohydrate metabolism comprising transforming at least one of inbred maize parent plants GE516214 and GE533139, representative samples of which have been deposited as PTA-4281 and PTA-4283 respectively, with a transgene encoding a protein selected from the group consisting of stearyl-ACP desaturase, fructosyltransferase, levansucrase, alpha-amylase, invertase and starch branching enzyme to generate an inbred maize parent plant with modified fatty acid metabolism or modified carbohydrate metabolism and crossing said inbred maize parent plants to produce said hybrid maize plant that confers modified fatty acid metabolism or modified carbohydrate metabolism.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

21. Document ID: US 6750384 B1

L6: Entry 21 of 31 File: USPT Jun 15, 2004

DOCUMENT-IDENTIFIER: US 6750384 B1
TITLE: Hybrid maize plant & seed 39R62

CLAIMS:

31. A method of producing a hybrid maize plant with modified fatty acid metabolism or modified carbohydrate metabolism comprising transforming at least one of inbred maize parent plants GE570800 and GE533276, representative samples of which have been deposited as PTA-5510 and PTA-5518 respectively, with a transgene encoding a protein selected from the group consisting of stearyl-ACP desaturase, fructosyltransferase, levansucrase, alpha-amylase, invertase and starch branching enzyme to generate an inbred maize parent plant with modified fatty acid metabolism or modified carbohydrate metabolism and crossing said inbred maize parent plants to produce said hybrid maize plant that confers modified fatty acid metabolism or modified carbohydrate metabolism.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

22. Document ID: US 6734339 B2

L6: Entry 22 of 31 File: USPT May 11, 2004

DOCUMENT-IDENTIFIER: US 6734339 B2
TITLE: Nucleic acid molecules encoding enzymes from wheat which are involved in starch synthesis

Detailed Description Text (38):
The functionality of the soluble starch synthase was tested by cotransformation of the plasmids pTaSSS.DELTA.188 and pACAG in the mutant G6MD2. The plasmid pTaSSS.DELTA.188 comprise nucleotides 188-2239 of the 2239 bp cDNA sequence, which code for the soluble starch synthase. The cDNA is inserted as Eco RI/Xho I fragment in the polylinker region of the pBluescript vector (Stratagene) This allows the N-terminus of the .alpha.-peptide of the beta-galactosidase encoded by the vector to be fused in frame with a part of the soluble starch synthase.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

23. Document ID: US 6730825 B1

L6: Entry 23 of 31 File: USPT May 4, 2004

DOCUMENT-IDENTIFIER: US 6730825 B1
TITLE: Isoforms of starch branching enzyme II (SBE-IIa and SBE-IIb) from wheat

Detailed Description Text (48):
pWxGS+ (FIG. 13) comprising a maize granule bound starch synthase gene (Shure et al 1983) promoter-GUS-Nos fusion was obtained as a gift to Unilever Research from Sue Wessler (University of Georgia, Athens, USA) and may be obtained on request from that source. The promoter in pWxGS+ is approximately 1.5 kb in length and represents a truncated version of a similar, but larger promoter fragment described in Russell & Fromm (1997). The sequence of the promoter (HindIII-BamH1 fragment) in pWxGS+ is presented in FIG. 13A (SEQ ID No: 55).

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

24. Document ID: US 6703240 B1

L6: Entry 24 of 31 File: USPT Mar 9, 2004

DOCUMENT-IDENTIFIER: US 6703240 B1
** See image for Certificate of Correction **
TITLE: Modified starch metabolism enzymes and encoding genes for improvement and optimization of plant phenotypes

Detailed Description Text (101):
For example, a NSME that has an improved starch synthase activity is obtained according to the present invention by performing recursive polynucleotide sequence shuffling on at least one naturally-occurring starch synthase or glycogen synthase gene with at least one additional (typically sequence-related) polynucleotide to form a library of shufflants, transferring, into host cells, the shufflants, in expressible form, generally including a suitable fused sequence encoding a chloroplast or amyloplast transit peptide sequence (if expression in plant cells is desired), and appropriate transcriptional and translational control sequences, hereby forming a population of shufflant-expressing host cells and/or their progeny, and selecting from said population of shufflant-expressing host cells or their progeny a subpopulation, comprising at least one cell, having a protein exhibiting a starch synthase catalytic activity having a statistically significant detectable improvement wherein the Km for ADP-glucose or for a derivatized glucose substrate (ADP-glucose-6-amine, ADP-glucose-6-aldehyde, ADP-glucose-6-carboxylic acid, ADP-glucose-2-amine, UDP-glucose-6-amine, alternatively derivatized position 2 or position 6 NDP-glucose analogs, and the like) is significantly lower than in a protein encoded by a parental polynucleotide encoding a naturally-occurring starch synthase enzyme, recovering the shufflant polynucleotide sequence(s) from said subpopulation, and subjecting the recovered shufflant polynucleotide sequence(s) to at least one subsequent round of shuffling and selection for the desired starch metabolic phenotype; said desired starch metabolic phenotype typically being, in this embodiment, enhanced incorporation into starches of ADP-glucose or one and/or more derivatized glucose substrate (i.e., monomer units which comprise reactive

substituents at position 2 or 6 of the glucosyl moiety - such as a ADP-glucose-6-amine, ADP-glucose-6-aldehyde, ADP-glucose-2-amine, and the like).

Detailed Description Text (136):
In some embodiments, the host cells of preference are plant cells. The resultant transgene and/or expression vector(s) encoding NSME protein(s) having the desired starch metabolic enzyme phenotype is transferred in expressible form into a plant cell, often a regenerable plant cell capable of regenerating an adult plant capable of asexual and/or sexual reproduction, such that progeny plants contain germline and/or somatic cells harboring the introduced selected shufflant polynucleotide in expressible form. Often, the selected shufflant polynucleotide sequence is placed under transcriptional control of starch metabolizing enzyme transcriptional regulatory sequences, such as those of the naturally-occurring starch synthase gene of the plant species that is the source of the regenerable plant cell into which the selected shufflant polynucleotide sequence is to be transferred; either in situ by homologous recombination targeting to an endogenous starch synthase gene locus, or by cloning and recombinant fusion of such transcription regulatory sequences to the coding sequence of the selected shufflant polynucleotide sequence. Adult plants and progeny derived from such transgenic regenerable plant cells express the encoded NSME and exhibit, e.g., novel starch synthase activity resulting in production of starches having an increased proportion of reactive position 2- or 6-glycosyl substituents ("increased reactivity starches"). Such increased reactivity starches are commercially desirable for their processing and fabrication properties, and advantageous crosslinkabilty properties for a variety of industrial, cosmetic, pharmaceutical, foodstuff, and other uses.

25. Document ID: US 6639125 B1

L6: Entry 25 of 31 File: USPT Oct 28, 2003

DOCUMENT-IDENTIFIER: US 6639125 B1
** See image for Certificate of Correction **
TITLE: Dull1 coding for a starch synthase and uses thereof

Detailed Description Text (31):
In another aspect, the present invention is also directed to a fusion construct, comprising part or all of the DNA the maize starch synthase enzyme fused to DNA encoding an affinity purification peptide. The present invention is also directed to the fusion protein expressed by such fusion constructs.

26. Document ID: US 6538179 B1

L6: Entry 26 of 31 File: USPT Mar 25, 2003

DOCUMENT-IDENTIFIER: US 6538179 B1
TITLE: Enhanced starch biosynthesis in seeds

Brief Summary Text (9):
In accomplishing the foregoing, there is provided, in accordance with one aspect of the present invention, a method of producing genetically transformed plants which have elevated starch content, comprising the steps of: (a) inserting into the genome of a plant cell a recombinant, double-stranded DNA molecule comprising (i) a promoter which for potato plants is selected from the group consisting of patatin promoters, large subunit potato ADPGPP promoter, small subunit potato ADPGPP, and granule-bound starch synthase promoter, and for tomato plants is selected from green fruit promoters, (ii) a structural DNA sequence that causes the production of an RNA sequence which encodes a fusion polypeptide comprising an amino-terminal plastid transit peptide and an ADPglucose pyrophosphorylase enzyme, (iii) a 3' non-translated DNA sequence which functions in plant cells to cause transcriptional termination and the addition of polyadenylated nucleotides to the 3' end of the RNA sequence; (b) obtaining transformed plant cells; and (c) regenerating from the transformed plant cells genetically transformed plants which have an elevated starch content.

Brief Summary Text (10):
In accordance with another aspect of the present invention, there is provided a recombinant, double-stranded DNA molecule comprising in sequence: (a) a promoter for potato plants is selected from the group consisting of patatin promoters, large subunit potato ADPGPP promoter, small subunit potato ADPGPP, and granule-bound starch synthase promoter; and for tomato plants is selected from green fruit promoters; (b) a structural DNA sequence that causes the production of an RNA sequence which encodes a fusion polypeptide comprising an amino-terminal plastid transit peptide and an ADPglucose pyrophosphorylase enzyme; and (c) a 3' non-translated region which functions in plant cells to cause transcriptional termination and the addition of polyadenylated nucleotides to the 3' end of the RNA sequence, said promoter being heterologous with respect to the structural DNA.

27. Document ID: US 6489540 B1

L6: Entry 27 of 31 File: USPT Dec 3, 2002

DOCUMENT-IDENTIFIER: US 6489540 B1
TITLE: Plastid-targeting nucleic acid sequence, a novel .beta.-amylase sequence, a stimulus-responsive promoter and uses thereof

Brief Summary Text (23):
The similarity of characteristics between chloroplasts and amyloplasts (Thomson and Whatley, 1980) is of relevance to the current invention, as it has been shown that the transit peptides from chloroplast-targeted polypeptides can import heterologous polypeptides into amyloplasts and vice versa. For example, the transit peptide from the maize granule bound starch synthase enzyme when fused to the E. coli .beta.-glucuronidase (GUS) protein will import the GUS protein not only into amyloplasts but also into chloroplasts (Klosgen and Weil, 1991).

28. Document ID: US 6379968 B1

L6: Entry 28 of 31 File: USPT Apr 30, 2002

DOCUMENT-IDENTIFIER: US 6379968 B1
TITLE: Transgenic plants or algae expressing an AGP enzyme coupled to a transit peptide

Drawing Description Text (9):
FIG. 8 shows the N terminal amino acid sequence of the rubisco activase--AGP small subunit fusion enzyme (SEQ ID No. 8), the N terminal amino acid sequence of the rubisco activase--AGP large subunit fusion enzyme (SEQ ID No. 9) and the N terminal amino acid sequence of the starch branching enzyme--AGP large subunit fusion enzyme (SEQ ID No. 10);

Detailed Description Text (68):
which provide a 1.62 kb PCR fragment with BamHI ends. The BamHI fragment containing the entire coding region of the AGP large subunit plus one additional amino acid (P) at the amino terminal end was inserted in the BamHI site of pBETP5 (FIG. 10). In this way the AGP large subunit was fused to the 75 amino acid potato starch branching enzyme transit peptide plus 26 amino acids of the mature branching enzyme. The fusion enzyme is expressed from a patatin promoter and terminated at a 35S terminator. The 3.4 Kb EcoRI fragment from the resulting plasmid (pPBL1) containing the patatin promoter, the starch branching enzyme transit peptide-AGP large subunit fusion enzyme, and the 35S terminator, was inserted in the EcoRI site of the plant transformation vector pVictorIV SGiN Man yielding plasmid pPPL5 (FIG. 12).

Detailed Description Text (69):
Amino Terminal Amino Acid Sequence of the Starch Branching Enzyme--AGP Large Subunit Fusion Enzyme

29. Document ID: US 6307125 B1

L6: Entry 29 of 31 File: USPT Oct 23, 2001

DOCUMENT-IDENTIFIER: US 6307125 B1
** See image for Certificate of Correction **
TITLE: Nucleic acid molecules encoding enzymes from wheat which are involved in starch synthesis

Detailed Description Text (45):
The functionality of the soluble starch synthase was tested by cotransformation of the plasmids pTaSSS.DELTA.188 and PACAG in the mutant G6MD2. The plasmid pTaSSS.DELTA.188 comprise nucleotides 188-2239 of the 2239 bp cDNA sequence, which code for the soluble starch synthase. The cDNA is inserted as Eco RI/Xho I fragment in the polylinker region of the pBluescript vector (Stratagene). This allows the N-terminus of the .alpha.-peptide of the beta-galactosidase encoded by the vector to be fused in frame with a part of the soluble starch synthase.

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw De

30. Document ID: US 6107060 A

L6: Entry 30 of 31 File: USPT Aug 22, 2000

DOCUMENT-IDENTIFIER: US 6107060 A
TITLE: Starch encapsulation

Brief Summary Text (29):
The starch-encapsulating region of the hybrid polypeptide may be a starch-encapsulating region of any starch-binding enzyme known to the art, e.g. an enzyme selected from the group consisting of soluble starch synthase I, soluble starch synthase II, soluble starch synthase III, granule-bound starch synthase, branching enzyme I, branching enzyme IIa, branching enzyme IIBb and glucoamylase polypeptides.

CLAIMS:

4. The hybrid polypeptide of claim 1 wherein said starch-encapsulating region is the starch-encapsulating region of an enzyme selected from the group consisting of soluble starch synthase I, soluble starch synthase II, soluble starch synthase III, granule-bound starch synthase, branching enzyme I, branching enzyme IIa, branching enzyme IIBb and glucoamylase polypeptides.

10. The hybrid polypeptide of claim 6 wherein said starch-binding enzyme is selected from the group consisting of a granule bound starch synthase, a soluble starch synthase, a glucoamylase and a branching enzyme.

11. The hybrid polypeptide of claim 8 wherein said starch-binding enzyme is selected from the group consisting of a granule bound starch synthase, a soluble starch synthase, a glucoamylase and a branching enzyme.

12. The hybrid polypeptide of claim 6 wherein said starch-binding enzyme is selected from the group consisting of a maize waxy protein, a rice waxy protein, a maize soluble starch synthase, a maize branching enzyme and a glycogen synthase.

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw De

31. Document ID: US 5977437 A

L6: Entry 31 of 31 File: USPT Nov 2, 1999

DOCUMENT-IDENTIFIER: US 5977437 A
TITLE: Transgenic plants or algae expressing an AGP enzyme coupled to a transit peptide

Drawing Description Text (9):
FIGS. 8.1-8.3 shows the N terminal amino acid sequence of the rubisco activase--AGP small subunit fusion enzyme (SEQ ID NO.8), the N terminal amino acid sequence of the rubisco activase--AGP large subunit fusion (SEQ ID NO.9)enzyme and the N terminal amino acid sequence of the starch branching enzyme--AGP large subunit fusion enzyme (SEQ ID NO.10);

Detailed Description Text (83):
which provide a 1.62 kb PCR fragment with BamHI ends. The BamHI fragment containing the entire coding region of the AGP large subunit plus one additional amino acid (P) at the amino terminal end was inserted in the BamHI site of pBETP5 (FIG. 10). In this way the AGP large subunit was fused to the 75 amino acid potato starch branching enzyme transit peptide plus 26 amino acids of the mature branching enzyme. The fusion enzyme is expressed from a patatin promoter and terminated at a 35S terminator. The 3.4 Kb EcoRI fragment from the resulting plasmid (pPBL1) containing the patatin promoter, the starch branching enzyme transit peptide-AGP large subunit fusion enzyme, and the 35S terminator, was inserted in the EcoRl site of the plant transformation vector pVictorlV SGiN Man yielding plasmid pPPL5 (FIG. 12).

Detailed Description Text (84):
Amino terminal amino acid sequence of the starch branching enzyme--AGP large subunit fusion enzyme.

Term	Documents
STARCH	188249
STARCHES	42438
SYNTHASE	20289
SYNTHASES	2203
BRANCHING	75821
BRANCHINGS	1033
ENZYME	170515
ENZYMES	146162
GRANULE	27300
GRANULES	134860
BOUND	329346
((STARCH SYNTHASE | STARCH BRANCHING ENZYME | (GRANULE$BOUND OR GRANULE BOUND) STARCH SYNTHASE) WITH (FUSION|FUSED| HYBRID)).PGPB,USPT,USOC.	31

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